

**UNIVERSIDADE ESTADUAL DE CAMPINAS**  
**FACULDADE DE ODONTOLOGIA DE PIRACICABA**

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**NÍVEL ÓSSEO MARGINAL EM**  
**POPULAÇÃO DE IDOSOS INSTITUCIONALIZADOS**

*Marginal Bone Level in Institutionalized Elderly Population*

Dissertação de Mestrado apresentada à  
Faculdade de Odontologia de Piracicaba  
da Universidade Estadual de Campinas  
para a obtenção do título de Mestre em  
Odontologia em Saúde Coletiva.

**Orientador: Prof. Dr. EDUARDO HEBLING**

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“Com o tempo, os conceitos mudam,  
os sonhos mudam...  
os planos mudam...  
a vida muda...  
Mas não se mudam princípios e valores...  
Mudei e continuo igual...  
Assim é o ser humano: tão coerente em  
suas contradições...”

JACKY CORREIA

## RESUMO

O aumento da longevidade da população mundial faz com que a expectativa de manutenção da dentição possa ser observada em idosos. Esse fato pode acarretar em aumento da prevalência das doenças periodontais nessa população. O objetivo desse estudo foi avaliar a condição periodontal de idosos institucionalizados. Foram utilizados dados secundários provenientes de estudo anterior. Foram avaliados os exames radiográficos periapicais padronizados obtidos de uma amostra de 70 pessoas, de ambos os gêneros, com idade acima de 65 anos, funcionalmente independentes ou parcialmente independentes, com o mínimo de 6 dentes em ambas as arcadas, residentes em duas instituições da cidade de Piracicaba-SP, Brasil. As radiografias foram avaliadas por um examinador calibrado ( $Kappa \geq 85\%$ ), em ambiente escuro, com uso de lupa, negatoscópio e paquímetro digital. O Nível Ósseo Marginal (NOM) interproximal foi utilizado como parâmetro de avaliação. Os dados foram avaliados pelos testes de Wilcoxon e Kruskal-wallis. A prevalência de reduzido NOM foi alta, influenciando a expressiva perda dentária observada entre os idosos. Nenhuma diferença na distribuição do NOM entre os grupos de dentes foi observada. Futuras ações e políticas de saúde devem ser desenvolvidas para melhorar a condição periodontal para essa população.

**Palavras-Chave:** prevalência; nível ósseo marginal; Odontogeriatrica; idosos; radiografia.

## **ABSTRACT**

The increase in longevity of the world population makes the expectation of maintenance of dentition can be observed in the elderly. This fact may result in increased prevalence of periodontal diseases in this population. The aim of this study was to evaluate the periodontal condition of institutionalized elderly. Secondary data from a previous study were used. Standardized periapical radiographic exams obtained from a sample of 70 subjects, both genders, aged above 65 years, functionally independent or partially independent, with a minimum of 6 teeth in both the arcades, residing in two institutions of the city of Piracicaba-SP, Brazil, were assessed. The radiographs were evaluated by a calibrated examiner ( $\kappa > 85\%$ ), in environment dark, using loupe, negatoscópio and digital caliper. Interdental Marginal Bone Level (MBL) was used as assessed parameter. The data were assessed by means of Wilcoxon and Kruskal-wallis tests. The prevalence of reduced MBL was high, influencing the expressive tooth loss among the elderly. No difference in a distribution of the MBL between the teeth groups was founded. Further preventive actions and health politics have been developed for improve the periodontal status for this population.

**Key-words:** prevalence; marginal bone level; elderly; geriatric dentistry; radiography.

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## **1- INTRODUÇÃO**

As projeções demográficas mostram que o século XXI será caracterizado pelo aumento do número de idosos, sendo que a população entre 60 e 85 anos tende a duplicar e, acima de 85 anos, triplicar até o ano de 2025, quando teremos em torno de 1,2 bilhões de pessoas com mais de 60 anos no mundo (IBGE, 1995; Organização das Nações Unidas, 2000).

A avaliação das condições de saúde bucal dos idosos no Brasil mostrou elevadas necessidades de atenção odontológica para essa população, com altos índices de perdas dentárias (Brasil, 2004).

Atualmente, a população brasileira com 60 anos ou mais, ultrapassa 15 milhões, podendo ser responsável por aproximadamente 15% da população brasileira em 2020 (Brasil, 2004). Estudos estimam que em 2025, entre os dez países no mundo com maior número de idosos, cinco serão países em desenvolvimento, incluindo o Brasil na sexta posição (Hebling, 2003).

A cárie e as doenças periodontais são as doenças bucais de maior prevalência na população mundial (Hebling, 2003). Alterações na capacidade mastigatória dos idosos são, na maioria das vezes, associadas à presença de cáries e doenças periodontais, e à ausência de dentes (Fukuda *et al.*, 2005).

O termo doença periodontal refere-se a diferentes quadros clínicos denominados doenças gengivais ou gengivite quando limitados aos tecidos de proteção, e denominados periodontites quando acometem os tecidos de suporte do elemento dentário. Assim a periodontite caracteriza-se por perda de inserção progressiva, incluindo destruição do ligamento periodontal e suporte

alveolar com consequente formação de bolsa periodontal, o que ocorre devido ao acúmulo microbiano modulado por uma série de fatores ambientais, locais e sistêmicos (Kumar, 2003).

É indiscutível a importância do exame radiográfico conjugado ao exame clínico na avaliação e no tratamento das doenças periodontais. As radiografias intra-bucais são rotineiramente utilizadas na clínica para dar suporte ao diagnóstico, ao plano de tratamento, ao prognóstico e, finalmente, à análise, em longo prazo, do resultado do tratamento instituído (Armitage, 1995). As radiografias exercem papel fundamental no diagnóstico, acompanhamento da progressão da doença periodontal e sobre alvo deste estudo, as sequelas advindas da ação da doença sobre as estruturas ósseas de suporte. Um dos métodos de análise desta atividade da doença periodontal é a medida de perda de inserção e de osso alveolar, mensurado através de parâmetros de referência da distância entre a junção cimento-esmalte (JCE) e a porção mais coronal da crista óssea alveolar (COA) (Fukuda *et al.*, 2005).

Cerca de 30 a 60% do conteúdo mineral ósseo precisa ser perdido antes que a lesão possa ser visualizada numa radiografia convencional, e por isso a perda óssea é visível radiograficamente somente depois que já houve uma grande destruição óssea (Cury *et al.*, 1999). Pelo fato do osso alveolar se apresentar sobreposto às raízes nas faces vestibular e palatina/lingual, a análise da perda óssea pode ser baseada nas medidas tomadas de imagens radiográficas das faces mesial e distal (Cury *et al.*, 1999).

Nos últimos cinquenta anos, a Odontologia no Brasil realizou seus estudos principalmente na área de prevenção e tratamento da cárie em

crianças de até doze anos (Collussi & Freitas, 2002). Como consequência, apenas a meta da Organização Mundial de Saúde (OMS) para o ano 2000 referente à idade de 12 anos foi alcançada, ou seja, o valor do índice CPO-D menor ou igual a três (Brasil, 2004). As metas de condições de saúde bucal estipuladas pela Organização Mundial de Saúde (OMS) para o ano 2000 era que 50% das pessoas na faixa etária de 65-74 anos apresentassem pelo menos 20 dentes em condições funcionais (Organização Mundial de Saúde, 1999). Contudo, o último levantamento epidemiológico nacional das condições de saúde bucal da população brasileira ocorrido em 2002-2003, revelou que o índice CPO-D (dentes cariados, perdidos e obturados) médio na população idosa com idade entre 65-74 anos foi de 27,79 (Brasil, 2004). O componente dente perdido foi elevado (25,83) (Brasil, 2004).

Com o avanço da idade vão ocorrendo alterações estruturais e funcionais, que embora variem de um indivíduo a outro, são encontrados em todos os idosos e são próprias do processo de envelhecimento normal. É obvio também que as doenças podem induzir tais modificações. Porém, nem sempre é fácil estabelecer os limites entre senescência e senilidade, ou seja, entre modificações peculiares do envelhecimento e as decorrentes de processos mórbidos mais comuns em idosos (Papaléo Neto, 2002).

Com o envelhecimento há diminuição progressiva da capacidade de manutenção do equilíbrio hemostático, que, em condições basais, não é suficiente para produzir distúrbio funcional. Quando, porém, este declínio é suficientemente grande, ocorre redução importante da reserva funcional, colocando o idoso muito próximo da eclosão de sintomas. Chegando a tal

ponto de distúrbios da hemostasia, no qual há redução das funções de diversos órgãos, a pessoa idosa correrá o risco de aumento da probabilidade de morbidade, se paralelamente, ocorrem modificações patológicas nestes órgãos. Essa interação de modificações fisiológicas próprias do envelhecimento e as decorrentes de processos patológicos são responsáveis pela apresentação clínica de diversas enfermidades (Papaléo Neto, 2002).

Durante o processo de envelhecimento, pode ser observada a presença de alterações dentárias como: a erosão, a atrição e abrasão. Elas se revelam através da destruição das estruturas dentais provocada, por exemplo, pela força ativa da mastigação como o desgaste da superfície oclusal dos elementos dentais, com a perda progressiva de tecido duro do dente (Hebling, 2003). Também pode ser observada a presença de migração apical da inserção epitelial da gengiva, alterações do cemento radicular e aumento da incidência de doença periodontal (Lascale & Lascale, 2002).

A ocorrência de migração dos tecidos gengivais para a região apical acontece em função da reabsorção óssea das corticais vestibular ou lingual, ocasionado a perda de suporte biológico do periodonto (Lascale & Lascale, 2002).

O diagnóstico por imagem, com uso de exame radiográfico padronizado, é um dos meios de detecção dessa perda óssea. Para tanto, são utilizadas radiografias periapicais realizadas pela técnica do paralelismo e processadas adequadamente. Apesar de apresentarem limitações pela sobreposição das imagens dos dentes e de outras estruturas ósseas por apresentar imagens em

apenas duas dimensões, esse exame mostra-se efetivo para a detecção de defeitos ósseos (Tugnait *et al.*, 2000).

O objetivo deste estudo foi investigar a condição periodontal, por meio da prevalência e distribuição da perda óssea marginal, em uma população de idosos brasileiros institucionalizados.

## **2. PROPOSIÇÃO**

O objetivo deste estudo foi investigar a condição periodontal, por meio da prevalência e distribuição da perda óssea marginal, em uma população de idosos brasileiros institucionalizados.

Este trabalho foi realizado no formato alternativo, conforme a deliberação da Comissão Central de Pós-graduação (CCPG) da Universidade Estadual de Campinas (UNICAMP) nº 001/98. O trabalho apresentado no Capítulo 1 foi realizado para alcançar o objetivo proposto.

**Marginal Bone Level in Institutionalized Elderly Population\***

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## **Marginal Bone Level in Institutionalized Elderly Population**

**Objective:** To investigate the prevalence and distribution of marginal bone loss (MBL) in a Brazilian institutionalized elderly population.

**Background:** The number of elderly in the general world population is rapidly increasing, and not only are more elderly retaining their natural teeth, but also the number of retained teeth in these individuals is increasing. This fact could be increase the prevalence of periodontal disease in this population. MBL is one of the parameter to evaluate the periodontal status.

**Materials and methods:** Seventy dentate elderly, mean age of 74 years, underwent a full-mouth radiographic survey. The MBL was measured with a digital caliper in mm by a calibrated examiner at the mesial and distal aspect of the tooth, from the cemento-enamel junction to the marginal bone.

**Results:** The prevalence of reduced MBL was high, influencing the expressive tooth loss among the elderly. No significant difference in a distribution of the MBL between the teeth groups was founded.

**Conclusions:** Further preventive actions and health politics have been developed for improve the periodontal status for this population.

**Keywords:** prevalence; marginal bone level; elderly; geriatric dentistry; radiography.

## **INTRODUCTION**

Around the world, the number of elderly people in the general population is rapidly increasing, and not only are more elderly retaining their natural teeth,



but also the number of retained teeth in these individuals is increasing (World Health Organization, 2002; Muller et al., 2007). This fact could be increase the prevalence of periodontal disease in this population (Petersen and Yamamoto, 2005).

Although severe periodontitis is found among the elderly population, mild to moderate cases are more commonly observed (Holm-Pedersen, 1991), probably because most elderly patients are edentulous. Such prevalence includes even those dentate elderly, for whom the dental extraction is usually considered adequate in cases of severe periodontal and periapical infections (Bahrami et al., 2008).

Risk factors for tooth loss have been shown to be gender (men had a higher risk of tooth loss than women) (Fardal et al., 2004), age (Papapanou et al., 1989), and smoking habit (Axelsson et al., 1998, Albandar et al., 2000, Dietrich et al., 2007). Cultural habits and educational level could also contribute to this elevated edentulous elderly rate (Siukosaari et al., 2011). In institutionalized and non-institutionalized elderly populations, larger number of missing teeth was observed among dentate with a lower educational level than those with a higher educational level (Helf and Gilbert, 1991; Slade et al., 1993; Holm-Pedersen et al. 2005; Makhija et al., 2006; Siukosaari et al., 2011). Social factors (Burt et al., 1990) and income (Gilbert et al., 1999; Ferreira et al., 2008) have been demonstrated as an impact on loss of teeth in an older population.

Marginal bone level (MBL) is one of the parameter to evaluate the periodontal status. A reduced marginal bone level has been shown to be associated with an increased risk of tooth loss (Dannewitz et al., 2006). Higher

risks of tooth loss in the posterior regions than in the anterior region have been observed (Bahrami et al., 2008).

Radiographs provide diagnostic information on alveolar bone levels, plaque retention factors, caries, furcation defects, subgingival calculus and additional pathologies (Tugnait et al., 2000).

Brazil is the seventh on the world in absolute number of elderly people. By 2025, the estimated data for this number will be projected almost the double, reaching about 33.2 million of elderly. By 2050, it will be the triple (Brazilian Institute of Geography and Statistics, 2000; World Health Organization, 2002; United Nations Population Division, 2003). Oral health data from Brazilian elderly population showed higher tax of edentulous people and poor periodontal status (Brazilian Dental Council, 2005).

The objective of this study was to investigate the prevalence and distribution of marginal bone loss (MBL) in a Brazilian institutionalized elderly population.

## **MATERIAL AND METHODS**

### **Subjects**

A convenience cluster sampling approach was adopted in this cross-sectional study to identify a 450 institutionalized elderly population in a city of Piracicaba, Sao Paulo State, Brazil. The Research Ethics Committee of Piracicaba Dental School, University of Campinas, Brazil, had approved the study design. The criteria of inclusion of the individuals in the sample were: 1) living in a selected elderly institution; 2) aged 60 years old or more; 3) showed 6 or more teeth in both arcades; 4) having medically and cognitively healthy

enough to undergo a dental examination; 5) fulfill, by themselves or helping by their caregivers, the consent form and the structured sociodemographic questionnaire. The study population showed 76% of edentulous (n=342) and 24% of dentate (n=108) subjects. From this last group, 82 persons were located showing the criteria of inclusion for this study. During the development of the survey, 12 persons were excluding for got sick, unable or have died. The selected sample was compound by seventy old people, both genders.

### **Radiographic Survey**

All participants underwent a full-mouth radiographic survey consisting of 14 periapicals and 2 bite-wings. The radiographs were taken in a calibrated X-ray unit (Spectro 70X Seletronic<sup>TM</sup>, Dabi Atlante, Ribeirao Preto, Brazil), using the paralleling technique, 70 kV, 8 mA, a film-focus distance of 280 mm, and etkaspeed film (Kodak Ektaspeed Plus<sup>TM</sup>, Eastman Kodak, Rochester, NY, USA). The films were processed automatically in calibrated equipment. The quality of the radiographs was evaluated immediately after processing. The radiographs were assessed under standardized conditions by one calibrated examiner using a magnifying lens (X1.3) and a viewing light of adjustable brightness in a dark room.

Excluding third molars, all teeth were recorded according to the FDI nomenclature. The marginal bone level was measured with a digital caliper in mm, rounded off to the nearest 0.1 mm. This instrument was calibrated on a standardized transparent ruler. The bone level measurements were performed at the mesial (M) and distal (D) aspect of the tooth, from the cemento-enamel junction to the most coronal part of the marginal bone, at which the lamina dura

had the normal width. In the case of a coronal restoration extending beyond the cemento-enamel junction, the border of the restoration was used as the reference point. In multi-rooted teeth, the reference root was the radiographically imaged longest root in premolars, the distal root in mandibular molars, and the palatal root in maxillary molars. The means of M e D measurements for each tooth ( $MBL^{Tooth} = MBL^M + MBL^D/2$ ) and individual ( $MBL^{Ind} = \sum MBL^{Tooth} / n^{Teeth}$ ) were calculated. The marginal bone level was classified in: normal ( $MBL < 3$  mm), borderline ( $3 \text{ mm} \leq MBL < 4$  mm), and reduced ( $MBL \geq 4$  mm) (Bahrami et al., 2006).

The calibration process of the examiner was developed by a benchmark dental examiner (“gold standard”), skilled in epidemiological surveys, conducted the calibration process, which lasted 28 hours. Theoretical activities with discussions on periodontal diagnosis criteria were performed. The measurements of ten percent of the sample were repeated one month later by the main examiner and the gold standard examiner. In the practical epidemiological examination activities, the inter- and intra-examiner reliability, assessed by percentage of agreement, were 82.0% and 95.5%, respectively.

### **Statistical analysis**

Measurements were summarized as means and standard deviations. Categorical variables were described by frequency distribution.

The tooth was used as the statistical recording unit. For each tooth group (incisors, canines, premolars and molars) the age dependency of the marginal bone level was evaluated by computing the mean MBL of all teeth in the tooth

group for each individual, and subsequently regress this mean on the age of the person. The variation around the regression line was used to estimate the inter-individual variation for each tooth group. The intra-individual variation was estimated from the variation between teeth in the same tooth group from the same person.

The data were assessed by T-test, Chi-square test, Wilcoxon test, and Kruskal-Wallis test.

## **RESULTS**

No statistically significant differences were observed (unpaired t-test,  $p=0.9095$ ) between the ages of women ( $n= 36$ ;  $78.0 \pm 7.9$  years) and men ( $n= 34$ ;  $77.8 \pm 7.1$  years).

The **Table 1** showed the number of teeth observed in the sample. The data analysis (Chi-Square test) whereas the ideal proportions expected (total expected) showed that all the observed proportions were significantly ( $p<0.0001$ ) lower than that expected.

The **Table 2** shows the proportion of subjects on the basis of the number of teeth of each type. The data analysis (Wilcoxon test) showed a higher proportion ( $p<0.0001$ ) of upper teeth than lower teeth. Whereas the comparison (Kruskal-wallis test) of teeth proportion (incisors/8, canines/4, pre-molars/8 molar/ 8) was possible to observe that the proportion of the mandibular incisors and canines was higher ( $p<0.05$ ) than the others, being that there were no statistically significant differences ( $p>0.05$ ) between the proportions of pre-molars and molars.

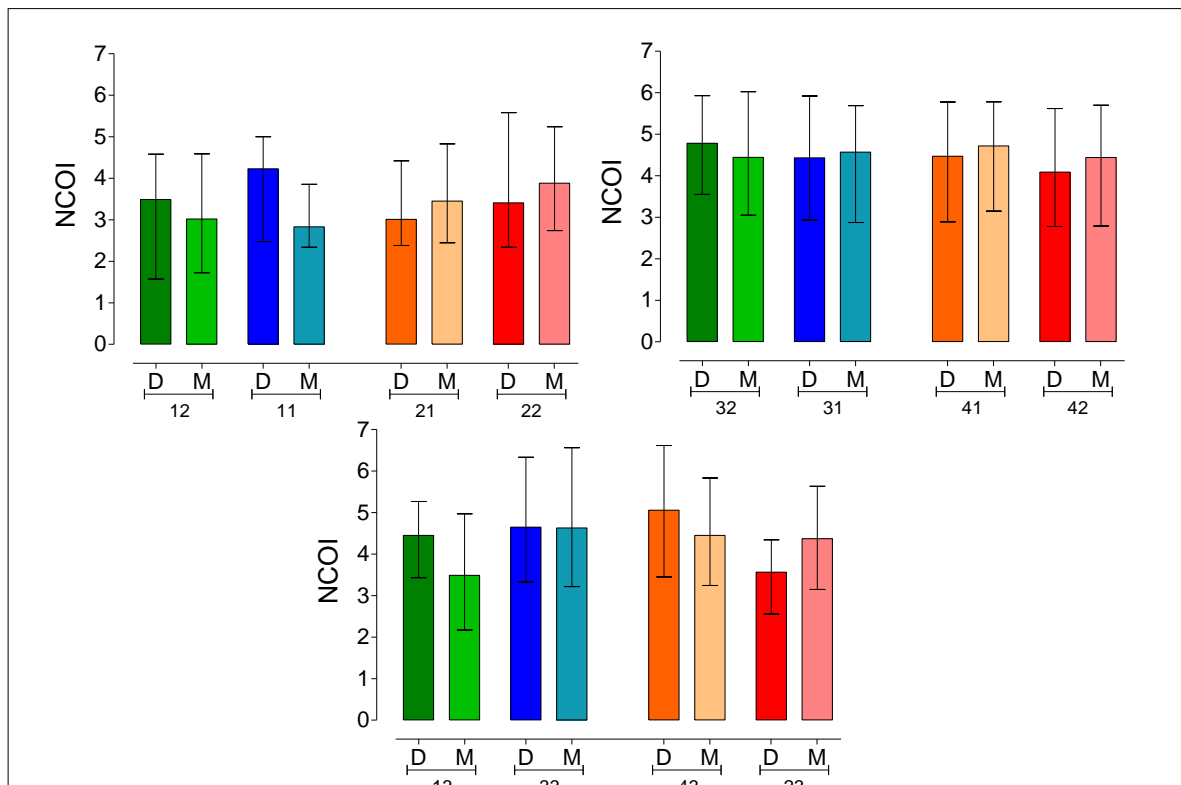
**Table 1:** Distribution of the number of expected and observed teeth as a function of their location in dental arcade for the 70 subjects.

<b>Teeth</b>	<b>Expected Teeth</b>	<b>Observed teeth</b>	<b>Loss Tax (%)</b>
<b>Incisors</b>	560	289	48.4
<b>Canines</b>	280	129	53.9
<b>Pré-molars</b>	560	149	73.4
<b>Molars</b>	560	85	84.8
<b>Upper teeth</b>	840	232	72.4
<b>Lower teeth</b>	840	420	50
<b>Total</b>	1680	652	61.2

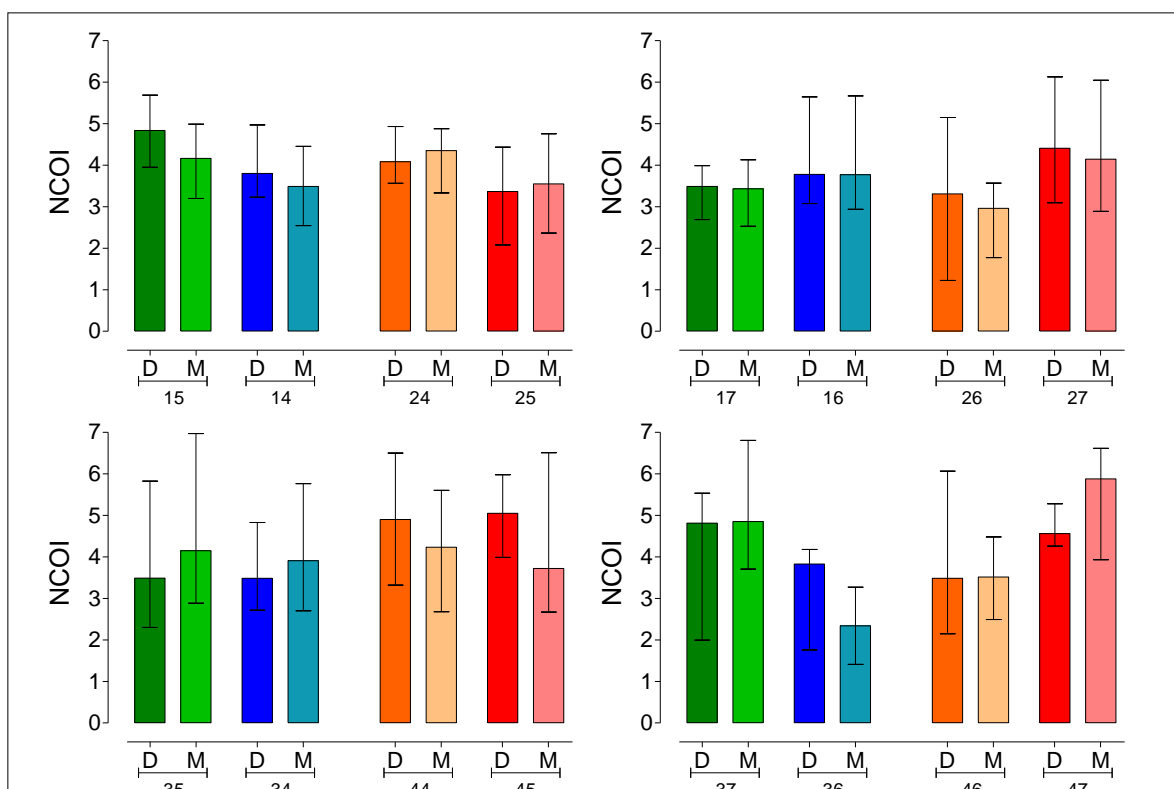
**Table 2:** Proportion of subjects/numbers o teeth in the sample

<b>Teeth</b>	<b>Number of observed teeth</b>				
	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Upper incisors</b>	43 (61.4%)	1 (1.4%)	6 (8.6%)	7 (10%)	13 (18.6%)
<b>Lower incisors</b>	10 (14.3%)	1 (1.4%)	11 (15.7%)	12 (17.1%)	36 (51.4%)
<b>Upper canines</b>	47 (67.1%)	11 (15.7%)	12 (17.1%)	-	-
<b>Lower canines</b>	12 (17.1%)	22 (31.4%)	36 (51.4%)	-	-
<b>Upper pre-molars</b>	48 (68.6%)	4 (5.7%)	7 (10%)	9 (12.9%)	2 (2.9%)
<b>Lower pre-molars</b>	25 (35.7%)	19 (27.1%)	7 (10%)	13 (18.6%)	6 (8.6%)
<b>Upper molars</b>	47 (67.1%)	5 (7.1%)	6 (8.6%)	7 (10%)	5 (7.1%)
<b>Lower molars</b>	52 (74.3%)	11 (15.7%)	5 (7.1%)	2 (2.9%)	0 (0%)

The **Figures 1 and 2** showed the values of marginal bone level (MBL) observed. No statistically significant differences were observed between the MBL showed in upper (Kruskal-Wallis test,  $p=0,3683$ ) and lower (Kruskal-Wallis test,  $p=0,9790$ ) incisors teeth.



**Figure 1:** MBL values (median and interquartile range) in relation to the distal (D) and medial (M) surfaces from incisors and canines teeth (NCOI=MBL values).



**Figure 2:** MBL values (median and interquartile range) in relation to the distal (D) and medial (M) surfaces from pre-molars and molars teeth (NCOI=MBL values).

Considering the canine teeth, although no significant differences were founded between the faces in each tooth separately, MBL values were higher in the lower canines than in the upper canines (Kruskal-Wallis test,  $p < 0.05$ ). No significant differences were founded between the MBL values from lower ( $p = 0.3026$ ) and upper ( $p = 0.0715$ ) pre-molar teeth, and from upper molars ( $p = 0.3020$ ). However, there was a tendency to lower MBL values for the lower first molars when compared to the lower second molars. No significant differences were founded between medial and distal surfaces of teeth. Thus, in general, the



interdental bone crest level (medial or distal surfaces) was not affected by the type of tooth.

The evaluation of the presence of the bone defect revealed that the median (1<sup>st</sup> and 3<sup>rd</sup> quartiles) of the patients was 16 (10 - 25.5) faces with bone defects, accounting for 78.8% (44.5% - 100%) of the faces observed. Just over two thirds of all observed faces presented with bone defects.

**Table 3** showed the proportion of affected teeth and faces with bone defects. No significant differences were founded between the presence of bone defects in incisor (Kruskal-Wallis test,  $p=0.0871$ ), canine (Kruskal-Wallis test,  $p=0.8086$ ), premolar (Kruskal-Wallis test,  $p=0.1800$ ) and molar (Kruskal-Wallis test,  $p=0.4420$ ) teeth.

Furcation lesions were not founded in pre-molar teeth. Considering the molars, 10 (12%) furcation defects were founded in 83 observed teeth. Four lesions were observed in the upper molars and the others on the lower molars. Of the 10 lesions, 8 were observed in only two patients (four lesions in each one).

**Table 3:** Distribution of the number of the teeth surfaces (% of total) with bone defects.

Side	Teeth	Upper		Lower	
		Distal	Medial	Distal	Medial
Right	Central incisor	13 (52.0)	10 (40.0)	37 (69.8)	38 (71.7)
	Lateral incisor	10 (47.6)	9 (42.9)	32 (62.7)	32 (62.7)
	Canine	15 (78.9)	12 (63.2)	41 (78.8)	35 (67.3)
	1 <sup>st</sup> Pre-molar	15 (88.2)	12 (70.6)	19 (67.9)	19 (67.9)
	2 <sup>nd</sup> Pre-molar	13 (92.9)	13 (92.9)	19 (82.6)	16 (69.6)
	1 <sup>st</sup> Molar	10 (76.9)	10 (76.9)	4 (66.7)	4 (66.7)
	2 <sup>nd</sup> Molar	12 (63.2)	12 (63.2)	6 (75.0)	6 (75.0)
Left	Central incisor	9 (42.9)	12 (57.1)	34 (69.4)	34 (69.4)
	Lateral incisor	12 (63.2)	13 (68.4)	37 (74.0)	35 (70.0)
	Canine	11 (68.8)	12 (75.0)	31 (73.8)	31 (73.8)
	1 <sup>st</sup> Pre-molar	7 (70.0)	6 (60.0)	16 (57.1)	17 (60.7)
	2 <sup>nd</sup> Pre-molar	7 (58.3)	8 (66.7)	8 (47.1)	10 (58.8)
	1 <sup>st</sup> Molar	6 (50.0)	6 (50.0)	2 (28.6)	2 (28.6)
	2 <sup>nd</sup> Molar	11 (78.6)	11 (78.6)	4 (66.7)	5 (83.3)

**Table 4** showed the crown status of the observed teeth. Data analysis (Kruskal-Wallis test) showed that, considering all the teeth together, the proportion of healthy or filled without cavitations crowns was significantly higher ( $p= 0.0206$ ) than carious/with cavitations or filled with cavitations crowns. Moreover, these conditions showed a higher proportion ( $p<0.05$ ) than those with prosthesis.

**Table 4:** Relative frequency of tooth crown status (% of total).

Tooth	Health	Carious or with cavitations	Filled with cavitations	Filled without cavitations	Prostheses	Total
11	3 (12.0)	7 (28.0)	6 (24.0)	4 (16.0)	5 (20.0)	25 (100)
12	4 (19.0)	8 (38.1)	6 (28.6)	1 (4.8)	2 (9.5)	21 (100)
13	5 (26.3)	5 (26.3)	3 (15.8)	3 (15.8)	3 (15.8)	19 (100)
14	5 (29.4)	1 (5.9)	2 (11.8)	5 (29.4)	4 (23.5)	17 (100)
15	3 (21.4)		1 (7.1)	5 (35.7)	5 (35.7)	14 (100)
16	1 (7.7)	1 (7.7)		7 (53.8)	4 (30.8)	13 (100)
17	4 (21.1)		4 (21.1)	7 (36.8)	4 (21.1)	19 (100)
21	3 (14.3)	8 (38.1)	4 (19.0)	4 (19.0)	2 (9.5)	21 (100)
22	5 (26.3)	4 (21.1)	4 (21.1)	4 (21.1)	2 (10.5)	19 (100)
23		8 (47.1)	5 (29.4)	3 (17.6)	1 (5.9)	17 (100)
24	4 (40.0)	2 (20.0)		2 (20.0)	2 (20.0)	10 (100)
25	1 (8.3)	3 (25.0)		3 (25.0)	5 (41.7)	12 (100)
26	2 (16.7)	1 (8.3)	1 (8.3)	4 (33.3)	4 (33.3)	12 (100)
27	3 (21.4)			7 (50.0)	4 (28.6)	14 (100)
31	30 (61.2)	17 (34.7)		2 (4.1)		49 (100)
32	30 (60.0)	15 (30.0)	2 (4.0)	3 (6.0)		50 (100)
33	16 (38.1)	14 (33.3)	5 (11.9)	6 (14.3)	1 (2.4)	42 (100)
34	4 (14.3)	4 (14.3)	3 (10.7)	13 (46.4)	4 (14.3)	28 (100)
35	5 (27.8)	2 (11.1)	2 (11.1)	7 (38.9)	2 (11.1)	18 (100)
36	2 (28.6)			2 (28.6)	3 (42.9)	7 (100)
37	1 (16.7)	1 (16.7)		2 (33.3)	2 (33.3)	6 (100)
41	36 (67.9)	14 (26.4)	2 (3.8)	1 (1.9)		53 (100)
42	30 (58.8)	15 (29.4)	3 (5.9)	1 (2.0)	2 (3.9)	51 (100)
43	22 (42.3)	19 (36.5)	7 (13.5)	3 (5.8)	1 (1.9)	52 (100)
44	9 (32.1)	5 (17.9)	4 (14.3)	6 (21.4)	4 (14.3)	28 (100)
45	6 (26.1)	2 (8.7)	3 (13.0)	6 (26.1)	6 (26.1)	23 (100)
46	1 (16.7)			2 (33.3)	3 (50.0)	6 (100)
47	1 (12.5)		1 (12.5)	5 (62.5)	1 (12.5)	8 (100)
Total	236 (36.1)	156 (23.9)	68 (10.4)	118 (18.0)	76 (11.6)	654 (100)

**Table 5** showed the roots status of observed teeth. Of total observed roots (n= 652), only 50 (7.7%) showed caries, cavities or filled with cavitations roots. Moreover, 8 roots showed overending fills (all in molar), 5 roots showed endodontic treatment (all in upper second molars) and 1 root showed apical lesion (2<sup>nd</sup> upper molar).

**Table 5:** Relative frequency of tooth root status (% of total).

Tooth	Health	Carious or with cavitations	Filled with cavitations	Filled without cavitations	Prostheses	Total
11	18 (72.0)	1 (4.0)	1 (4.0)	1 (4.0)	4 (16.0)	25 (100)
12	20 (95.2)				1 (4.8)	21 (100)
13	15 (78.9)	2 (10.5)			2 (10.5)	19 (100)
14	14 (82.4)				3 (17.6)	17 (100)
15	10 (71.4)			2 (14.3)	2 (14.3)	14 (100)
16	12 (92.3)	1 (7.7)				13 (100)
17	15 (78.9)	2 (10.5)		1 (5.3)	1 (5.3)	19 (100)
21	17 (81.0)	2 (9.5)			2 (9.5)	21 (100)
22	16 (84.2)		1 (5.3)		2 (10.5)	19 (100)
23	13 (76.5)	2 (11.8)	1 (5.9)		1 (5.9)	17 (100)
24	7 (70.0)	2 (20.0)			1 (10.0)	10 (100)
25	7 (58.3)	1 (8.3)			4 (33.3)	12 (100)
26	10 (83.3)	1 (8.3)			1 (8.3)	12 (100)
27	13 (92.9)				1 (7.1)	14 (100)
31	48 (98.0)	1 (2.0)				49 (100)
32	46 (93.9)	2 (4.1)		1 (2.0)		49 (100)
33	36 (85.7)	5 (11.9)		1 (2.4)		42 (100)
34	23 (82.1)	2 (7.1)		1 (3.6)	2 (7.1)	28 (100)
35	14 (77.8)	1 (5.6)	1 (5.6)		2 (11.1)	18 (100)
36	6 (85.7)				1 (14.3)	7 (100)
37	4 (66.7)	2 (33.3)				6 (100)
41	50 (94.3)	3 (5.7)				53 (100)
42	46 (90.2)	3 (5.9)			2 (3.9)	51 (100)
43	44 (84.6)	7 (13.5)			1 (1.9)	52 (100)
44	20 (71.4)	4 (14.3)		3 (10.7)	1 (3.6)	28 (100)
45	16 (72.7)	2 (9.1)		1 (4.5)	3 (13.6)	22 (100)
46	5 (83.3)				1 (16.7)	6 (100)
47	8 (100)					8 (100)
Total	553 (84.8)	46 (7.1)	4 (0.6)	11 (1.7)	38 (5.8)	652 (100)

## **DISCUSSION**

Conventional radiographic exam is the most commonly employed method in use to assess the marginal bone level, which requires the least intervention. The position of the bony crest is imaged, enabling estimation of the degree of bone loss. The pattern of bone loss can be seen and is broadly described as horizontal or vertical [4]. The location of any vertical (angular) defects can be identified. Some subjective information on bone quality may be gained and if the apices are shown, then the crown–root ratio can be determined. The position of the alveolar bone level in health must be established in order to quantify the amount of crestal bone loss that has occurred. If “no clinical attachment” loss is interpreted as health then “no clinical attachment” loss is consistent with a distance from the cement–enamel junction of between 0.4 and 1.9 mm on bite-wing radiographs [5]. Other studies have used a crestal position of more than 2 mm [6] or 3 mm [7, 8] from the cement–enamel junction as thresholds for evidence of bone loss.

A relationship between radiographic assessments of bone height and probing attachment loss is demonstrated in several studies, though the degree of correlation reported differs quite considerably and alters between pre-treatment and post-treatment assessments [10, 11, 12, 13]. A poorer degree of correlation was noted between radiographic bone height and probing depths [11]. Longitudinal studies have shown that clinical attachment loss precedes radiographic bone loss as detectable by conventional radiography [14, 15].

Radiographs may be able to demonstrate furcation involvement of multirrooted teeth and calculus deposits and rarer anatomical defects, such as enamel pearls.

The radiographic image should be interpreted with caution; seeing does not always believe. Several studies report that the amount of bony destruction is underestimated in panoramic and periapical radiographs, the degree of underestimation differing in the various studies [3, 10, 19, 20]. The radiographic assessment of osseous destruction depends on the degree of bone loss that has taken place; it is underestimated in initial periodontal disease, relatively accurate in moderate disease and overestimated in severe disease [11, 20]. Radiographic bone levels may be assessed by different methods such as direct measurement in millimeters from the cement–enamel junction [10, 21] or as a percentage of tooth or root length [22, 23].

Even if a change in diagnosis or treatment results from new radiographic findings, the measure of clinical effectiveness is that treatment outcomes for the patient improve when diagnostic radiography is used. A major difficulty lies in the identification of appropriate treatment outcomes. The American Academy of Periodontology has recently produced a document entitled “Parameters of Care” in which it seeks to identify treatment outcomes for periodontal therapy [55]. A period of consultation is also underway within the British Society of Periodontology to develop appropriate outcomes for clinical periodontal treatment in the UK. In clinical periodontal research, outcomes have generally been considered in terms of clinical attachment loss, probing measurements or bleeding. These can be described as proximate outcomes which are the

immediate result of intervention and are usually measured relatively soon after treatment [56]. Such outcomes are quantifiable by the examiners, can be performed on repeated occasions and can generate information on the results of therapy within a realistic time frame for the operator and patient.

Ultimate outcomes may be the number of years that teeth are retained, the function or aesthetics gained or lost and these outcomes may actually be of greater significance to our patients and their perceptions of the outcomes of their treatment. Unfortunately, although there must be a relationship between, for instance, attachment loss and tooth loss, the exact nature of the relationship between such proximate outcomes and longer-term ultimate outcomes has yet to be described. It makes the assumption that a tooth with sensitivity or poor aesthetics is not equivalent to a sound tooth. It is becoming clear that the concept of benefit must reflect a patient's value judgements and not only the profession's.

Brazilian culture is a mosaic of multiple ethnic groups that tend to retain their customs, especially those who migrated from rural to urban areas. This population, specially the actually elderly population, brings with them their cultural backgrounds with different health habits, diet and beliefs concerning oral health. This population is of interest as a group that has not yet acculturated to the dominant culture and the benefits of preventive dentistry methods initiated several decades ago.

Brazil had 117.5 dentists and 30.2 dental specialists per 100,000 inhabitants (CFO, 2009). Although the ratio of dentists per 100,000 inhabitants is substantially higher in Brazil compared with other countries, Brazilian dentists



are not equally distributed throughout the country. There is a public dental care system, but availability of care is limited. Many elderly Brazilians subsist on low incomes and cannot afford treatment at private dental clinics. In the past time and actually in some regions, most older adults must pay for their dental treatment; this often results in teeth being extracted rather than receiving complex expensive treatment (Colussi & Freitas, 2007). The data of this present study showed higher rates of edentulous patients among the elderly. This fact can contribute with the high prevalence of reduced MBL observed in this population. Further preventive actions have to develop to improve the periodontal status for this population.

Despite the high prevalence of elderly edentulous, the treatment need is higher among those who have successfully retained their natural dentition into old age. Maintaining a healthy dentition between the current and future elderly will be the great challenge of Dentistry, seeking the active aging population in coming decades. All oral health care services, both public and private, are responsible for overcoming this future challenge.

## **CONCLUSION**

The prevalence of reduced MBL was high, influencing the expressive tooth loss among the elderly. Further preventive actions have to develop to improve the periodontal status for this population.

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#### **4. CONCLUSÕES GERAIS**

A prevalência de reduzido Nível Ósseo Marginal (NOM) foi alta, influenciada pela expressiva perda de dentes entre os idosos.

Não houve diferença na distribuição do NOM entre os grupos de dentes avaliados.

Futuras ações e políticas devem ser desenvolvidas para melhorar a condição periodontal em idosos.

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\* Referências da Introdução Geral dessa dissertação, de acordo com as normas da FOP/UNICAMP, baseadas nas normas do *International Committee of Medical Journal Editors* – Grupo de Vancouver, de 2006. Abreviatura dos periódicos em conformidade com o *Medline*.

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ANEXOS

ANEXO 1:

Parecer do Comitê de Ética em Pesquisa



**COMITÊ DE ÉTICA EM  
PESQUISA**  
FACULDADE DE ODONTOLOGIA DE  
PIRACICABA  
UNIVERSIDADE ESTADUAL DE  
CAMPINAS



**CERTIFICADO**

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa "**Avaliação radiográfica da condição periodontal de idosos**", protocolo nº 090/2010, dos pesquisadores Eduardo Hebling e Silvia Ferreira de Souza, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 01/09/2010.

The Ethics Committee in Research of the School of Dentistry of Piracicaba - State University of Campinas, certify that the project "**Radiographic assessment of periodontal status of elderly**", register number 090/2010, of Eduardo Hebling and Silvia Ferreira de Souza, comply with the recommendations of the National Health Council - Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee at 09/01/2010.

**Prof. Dr. Pablo Agustin Vargas**  
Secretário  
CEP/FOP/UNICAMP

**Prof. Dr. Jacks Jorge Junior**  
Coordenador  
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.  
Notice: The title of the project appears as provided by the authors, without editing.

ANEXO 2:

Declaração de aprovação



UNIVERSIDADE ESTADUAL DE CAMPINAS  
Faculdade de Odontologia de Piracicaba



DECLARAÇÃO

O Coordenador da Comissão de Pós-Graduação da Faculdade de Odontologia de Piracicaba declara que **SILVIA FERREIRA DE SOUZA**, aluna regularmente matriculada sob registro acadêmico nº 087508, defendeu sua Dissertação de **Mestrado Profissionalizante em ODONTOLOGIA EM SAÚDE COLETIVA**, no dia 28 de Julho de 2011, perante a Comissão Julgadora composta pelos Professores Doutores: EDUARDO HEBLING, DAGMAR DE PAULA QUELUZ e FERNANDA LOPES DA CUNHA, tendo sido considerada **APROVADA**. Para que o respectivo título possa ser concedido, com as prerrogativas legais dele advindas, é necessário que ocorra a homologação do exemplar definitivo da respectiva **Dissertação** pelas instâncias competentes da UNICAMP. Piracicaba, 28 de Julho de 2011.

A handwritten signature in blue ink, appearing to read "Renata C. M. Rodrigues Garcia".

Profa. Dra. Renata C. M. Rodrigues Garcia  
Coord. dos Cursos de Pós-Graduação  
FOP/UNICAMP - Matr. 24558-5

**ANEXO 3:** Correspondência de submissão do artigo para publicação.

To Dr. **JAMES P. NEWTON**  
Editor of *Gerodontology*

Dear Dr. Newton,

Please find a copy of a manuscript entitled “***Marginal Bone Level in Institutionalized Elderly Population***”, which we hope you consider favorable for publication in this paper. The authors transfer all copyright ownership of this paper to the Editorial Council of *Gerodontology* in the event of the paper is published. The authors warrant that this article is original, does not infringe upon any copyright or other proprietary right of any third party, is not under consideration for publication by any other journal, and has not been published elsewhere. The authors have reviewed and approved the final version of the manuscript.

Sincerely yours,

**EDUARDO HEBLING**  
DDS, MSC, PHD  
Responsible author

## APÊNDICES

### APÊNDICE 1: Normas para publicação no periódico *Gerodontology*.

#### Author Guidelines

##### 1. GENERAL

The ultimate aim of the subject area of gerodontology is to improve the quality of life and oral health of older people. Gerodontology fills the particular place of serving this subject area. The boundaries of most conventional dental specialities must be repeatedly crossed to provide optimal dental care for older people. Furthermore, management of other health problems impacts on their dental care and clinicians need knowledge in these numerous overlapping areas. Bringing together these diverse topics within one journal serves clinicians who have not time to scan many journals and it serves authors whose papers would therefore fail to access their target readership. The juxtaposition of papers from different specialities but sharing this patient-centered interest provides a synergy that serves progress in the subject of gerodontology.

Please read the instructions below carefully for details on the submission of manuscripts, the journal's requirements and standards as well as information concerning the procedure after a manuscript has been accepted for publication in Gerodontology. Authors are encouraged to visit <http://authorservices.wiley.com/bauthor/> for further information on the preparation and submission of articles and figures.

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Gerodontology adheres to the below ethical guidelines for publication and research.

###### 2.1. Authorship and Acknowledgements

Authors submitting a paper do so on the understanding that the manuscript have been read and approved by all authors and that all authors agree to the submission of the manuscript to the Journal.

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###### 2.2. Ethical Approvals

Papers involving clinical research should conform to the guidelines issued in the Declaration of Helsinki ([www.wma.net/e/policy/b3.htm](http://www.wma.net/e/policy/b3.htm)) where applicable, and should include a statement that ethical approval has been given by the relevant committee.

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#### 3.3. Blinded Review

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To allow double-blinded review, please submit (upload) your main manuscript and title page as separate files.

Please upload:

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## 4. MANUSCRIPT FORMAT AND STRUCTURE

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### 4.2. Structure

Original Articles submitted to *Gerodontology* should include: Title Page, Abstract, Introduction, Material and Methods, Results, Discussion, Conclusions, References, and Acknowledgements, Tables, Figures and Figure Legends were appropriate.

Title Page: should contain the title of the article, name(s) of the author(s), initials, and institutional affiliation(s), a running title not to exceed 40 letters and spaces, and the name and complete mailing and email address of the author responsible for correspondence. The author must list 4 keywords for indexing purposes.

Abstract: A separate structured abstract should not exceed 250 words. The abstract should consist of 1) the objective 2) the background data discussing the present status of the field 3) materials and methods 4) results 5) conclusion.

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Acknowledgements: Acknowledge only persons who have made substantive contributions to the study. Authors are responsible for obtaining written permission from everyone acknowledged by name because readers may infer their endorsement of the data and conclusions. Sources of financial support may be acknowledged.

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Examples:

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(List all authors up to 3; for 3 or more list the first 3 and add 'et al.')

Dockrell H, Greenspan JS. Histochemical identification of T- cells in oral lichen planus. *Oral Surg* 1979; 48: 42-49.  
Thomas Y, Sosman J, Yrigoyen O, et al. Functional analysis of human T- cell subsets defined by monoclonal

antibodies. I. Collaborative T-T interactions in the immunoregulation of B-cell differentiation. *J Immunol* 1980; 125: 2402-2405.

(2) Corporate author

The Royal Marsden Hospital Bone- Marrow Transplantation Team. Failure of syngeneic bone- marrow graft without preconditioning in post- hepatitis marrow aplasia. *Lancet* 1977; 2: 628-630.

(3) No author given

Anonymous. Coffee drinking and cancer of the pancreas [Editorial]. *Br Med J* 1981; 283: 628-635.

(4) Journal supplement

Mastri AR. Neuropathology of diabetic neurogenic bladder. *Ann Intern Med* 1980; 92 (2 pt 2): 316- 324.  
Frumin AM, Nussbaum J, Esposito M. Functional asplenia: demonstration of splenic activity by bone marrow scan. *Blood* 1979; 54 (suppl 1): 26- 28.

(5) Journal paginated by issue

Seaman WB. The case of the pancreatic pseudocyst. *Hosp Pract* 1981; 16 (Sep): 24-29.

(6) Personal author(s)

Eisen HN. Immunology: an introduction to molecular and cellular principles of the immune response, 5th edn. New York: Harper Row, 1984:406-420

(7) Editor, compiler, chairman as author

Dausset J, Colombani J, eds. Histocompatibility testing 1972. Copenhagen: Munksgaard, 1973: 12-18.

(8) Chapter in a book

Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA Jr, Sodeman WA, eds. Pathologic physiology: mechanisms of disease. Philadelphia: WB Saunders, 1974: 457-480.

(9) Published proceedings paper

DePont B. Bone marrow transplantation in severe combined immunodeficiency with an unrelated MLC compatible donor. In: White HJ, Smith R, eds. Proceedings of 3rd Annual Meeting of the International Society for Experimental Hematology. Houston: International Society for Experimental Hematology, 1974: 44-50.

(10) Agency publication

Ranofsky AL. Surgical operations in short-stay hospitals: United States - 1975. Hyattsville, Maryland: National Center for Health Statistics, 1978; DHEW publication no. (PHS) 78-1785. (Vital and health statistics; series 13; no. 34.)

(11) Dissertation or thesis

Cairns RB. Infrared spectroscopic studies of solid oxygen. Berkeley, CA: University of California, 1965. 156pp. Dissertation.

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